Equipment Capabilities

Topics Covered in This Course

- Navigating the Caterpillar Performance Handbook
  - Nomenclature
  - Recognizing how to "factor" for reality in each situation
- Most common earthmoving equipment
- Techniques for excavating large cuts
  - Pioneering
  - Excavating (various techniques)
  - Slope finishing

Topics Covered in This Course

Class Examples:

- Dozer production
- Excavator productions
  -Ideal: ie. Borrow Source
  -While constructing a cut slope
- Front End Loaders (wheel Mounted)
- Load/Cycle Times
  – Determine ideal # of trucks, etc.
- Motor Grader productions
  -haul road maintenance vs. finishing to hubs

Dozers

- Chapter 1 of Caterpillar Handbook
- Blade Types (1-28)
  -S (Straight)
  -U (Universal)
  -SU
- Push Distances
  -Depends on conditions
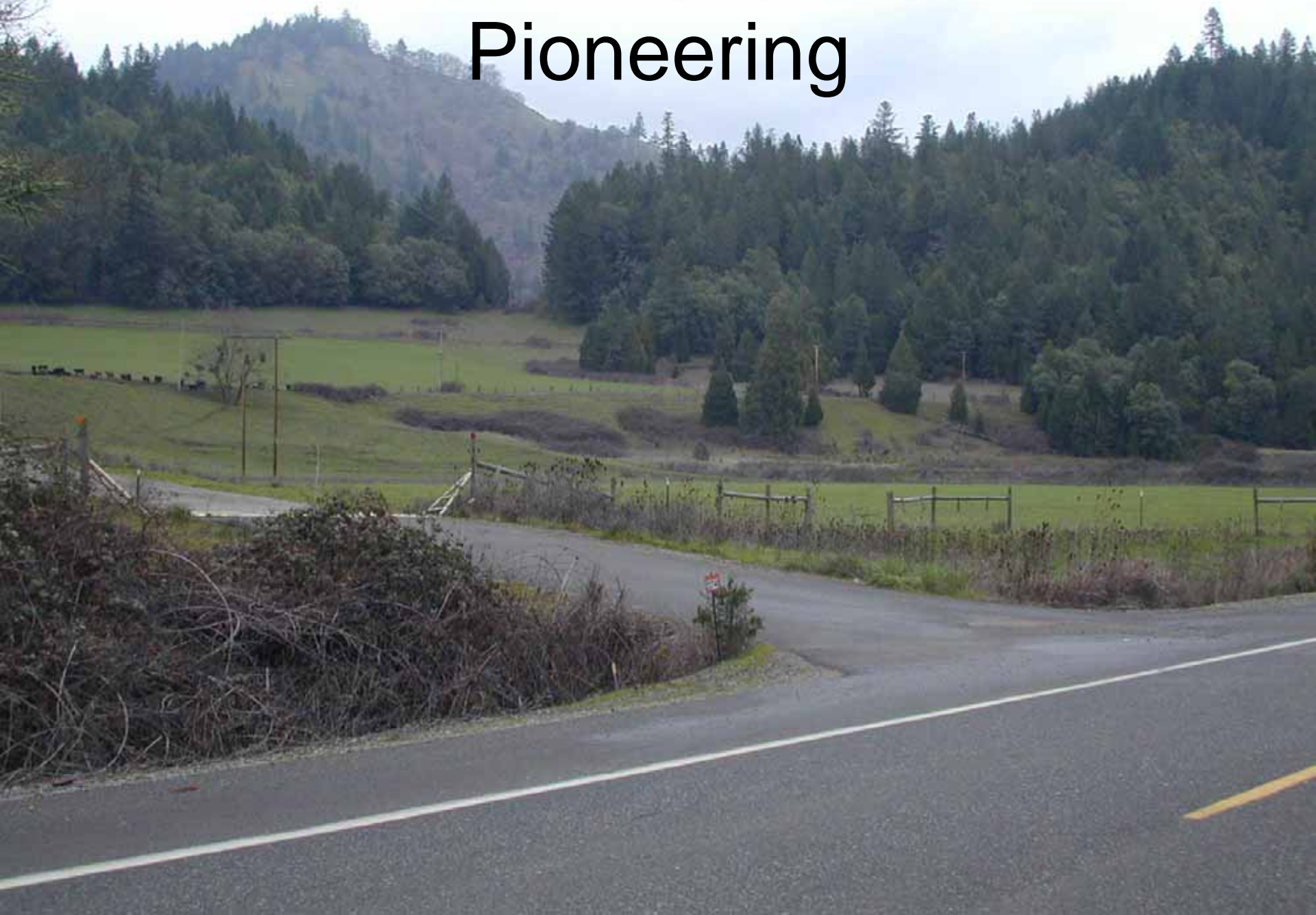 -Generally not more than 300 feet

Dozers (continued)

- Estimating Dozer Productions
  - Refer to example on 1-46
- How Track Width/length affects ground pressure
  - Example (see page 1-20): D6T XL, XW, LGP
  - Ground Pressure = operating weight divided by ground contact area

Pioneering

Scrapers

- Advantages:
    - *can be* self-loading
    - -self-hauling
    - -self-dumping
    - -self-compacting
- Disadvantages:
  -not suitable for rocky material
  - scrapers can be hard to procure these days
  -low utilization results in high operating costs
- Generally productive hauling one way from 400 feet up to 1 mile

Common Roller Types

- Smooth Drum – Good for sands and gravels
- Sheepsfoot – Kneading action, good for silty soils
- Both can be vibratory or static
- Grid Rollers – Static, mostly for rock fills

Hydraulic Excavators

- Chapter 4 of Caterpillar Handbook
- Bucket Capacity
  - See 4-119 thru 4-133
- Lifting Capacity
  - See 4-65
- Load Heights and Max. Reach
  - See 4-41 thru 4-63

- What do the model numbers mean?
  - Cat 3<u>30</u> = 30 metric ton operating weight
  - Hitachi, John Deer, Komatsu <u>30</u>0 =30 m.t.

Hydraulic Excavators

- Know the difference between ideal conditions and tough conditions
- Match Excavator to Haul vehicle
  - Bucket size should be 1/3 to 1/6 volume of haul vehicle
  - See Maximizing Production on 4-187

Determine the Optimum # of Trucks

- Loader Time = time it takes to load the haul vehicle

- Truck Cycle Time = time to back into position + loading time + travel time to dump site + dump time + return travel

- Optimum # of trucks = **Truck Cycle time** divided by the **Load Time**

Determine the Optimum # of Trucks

Given: A Cat 345C hydraulic excavator with a 4 cy mass excavation bucket is being used with 12 cy dump trucks to transport material from a borrow source to an embankment area.

- Excavator
  - Assume that it takes 2 minutes to load each truck.
  - Excavator Cost per hour is $150/hour

Determine the Optimum # of Trucks (continued)

- Trucks
  - Time to back into position for loading = 1 minute
  - Loading time = 2 minutes
  - Travel to dump = 6 minutes
  - Dump time = 1 minute
  - Return travel = 5 minutes
  - Truck Cost each is $70/hour

Determine the Optimum # of Trucks (continued)

- Find the optimum # of trucks
- What is the cost $/cy using the optimum?
- What is the cost $/cy by using 1 less truck than optimum?
- What is the cost $/cy by using 1 more truck than optimum

Wheel Mounted Loaders

- Requirements/Disadvantages
  - Smooth floor to operate on
  - enough room to maneuver

- Main Advantages
  - Speed
  - Shorter cycle times (used in the right environment)
  - Less fatigue on the operator
  - Travel on paved roads
  - Lower wear and tear = lower maintenance costs

Motor Graders

- Chapter 2 of Caterpillar Handbook
- Moldboard lengths of 12' and 14' most common
  - 12' moldboard standard on 120, 135, **12 & 140** models
  - 14' moldboard standard on 160, **163 & 14** models
  - 16' moldboard standard on the 16 model
  - 24' moldboard standard on the 24 model (mining operations)
- Note: moldboard is usually angled when moving material, therefore reducing the effective blade length

Motor Graders

- See example on page 2-16 and 2-17
- A=S * (Le – Lo) x 5280 x E
  - Use this formula with CAUTION
  - It assumes 1 PASS only
  - Road maintenance 7.33 acres per hour?
    - This is very optimistic even for maintenance blading
  - Use realistic efficiency ratings and speeds

- Based on Experience a realistic Finish Grading Production Rate is about 1 acre per DAY !
  - This equates to about 1,090 lineal feet per day if subgrade is 40 feet wide